Generic service request procedure in a multimode system

Background of the Invention

1. Technical Field

5   The present invention relates to telecommunications and, more particularly, to

mobile telecommunications terminals and utilization of network services.

2. Discussion of Related Art

Multimode terminals are getting more and more popular. Multimode terminals are

10   capable of operating on different system modes (using different radio access

technologies and/or able to attach to different core networks). Examples of different

system modes are GERAN, WCDMA, TDMA, AMPS, CDMA 2000, WLAN,

Bluetooth etc. Multimode networks may support different types of interworking

between the system modes supported by the terminal.

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Currently the terminal already provides some information about its capability in

different system modes, making the network aware which services the terminal can

support in different system modes. An example is a GERAN terminal indicating its

capabilities; in addition to the capabilities for GERAN access technology, also if it

20   supports WCDMA and/or CDMA 2000 radio access technologies. The terminal may

have quite different support for services depending on the serving system mode. For

example, simultaneous packet and circuit switched service is only possible if both the

GERAN network and terminal support dual transfer mode (DTM) while this service is

always supported by a GERAN/UTRAN dual mode terminal when served by

25   UTRAN. Similarly, if the GERAN network does not support high speed data, then the

circuit switched data rate is limited to 9.6 kbit/s for GERAN access while a higher

data rate is likely available through WCDMA and an even higher data rate through

WLAN. GERAN again might support a location service when any of the other modes

supported by the multimode terminal do not support this service. However, when the

30   terminal requests a service, the request is limited to the services supported by the

terminal in the currently serving system mode, additional restrictions may be set if the

network indicates non-support for some specific network capabilities.

In 3GPP standardisation, different vendors are proposing different ways to solve specific problems where GERAN capabilities are not enough to support a service and thus inter-system change from GERAN to UTRAN is proposed. For example, 3GPP TSG-SA WG1 #21 (Sophia Antipolis, France June 7-11, 2003) proposes to allow a

5   UE that has CS multimedia capability and that is camping on a GERAN cell but is also within UTRAN coverage to setup a CS multimedia service using a UDI 64 kbit/s bearer in UTRAN. Another example is 3GPP TSG-SA2 #33 (also June 7-11, 2003) which introduces a proposal for a new procedure for dual CN connection where a UMTS/GSM terminal roaming in GSM in the neighbourhood of UTRAN coverage is

10   allowed to request a dual CN connection to the BSS, even if the MS is not Class A or if DTM is not supported by the MS and/or the BSS, in order to indicate that a handover or a cell change order to UTRAN should be favoured by the BSS.

Currently there already exist other similar problem cases for other services as well,

15   and the above mentioned proposed solutions by different vendors are not applicable for solving the problems for these other cases but are only directed to narrow and particular problems. The difficulty in these solutions is that they are targeted to a specific problem and are not suitable for solving the issue in generic way (though, these proposals are not actually acceptable to solve the mentioned problems). In this

20   invention disclosure it is shown that a generic mechanism should be applied into the 3GPP specifications to solve the problem in a generic way.

A further example solution is given in the EPO patent No 0716797B1 where the mobile station utilises service specific PLMN preference lists and where the mobile

25   station then selects the PLMN according to the corresponding preference list for the service requested by the user.

Still another example is given in the Finnish patent FI 105309B where the mobile station is aware of the different services supported by different available PLMNs and

30   where the mobile stations selects the PLMN according to the requested service.

Still another example is given in the US patent application 2003/0114158A1 where terminal either directly or indirectly requests intersystem handover in order to

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establish the requested service. In this patent the preference list in either terminal or network is needed in order to tie the specific service to the specific system.

5   The disadvantage of these solutions is that the mobile station awareness of the services available from different PLMNs cannot be easily arranged. Also the support of services by different PLMNs may not only depend on the capabilities of the PLMN but also e.g. on the load of the networks and then the support of a specific service may be time dependent. Also the service availability may be location dependent e.g. as a function of the capabilities of the serving cell. Also the disadvantage is the need to

10   have service/content based preference lists either in terminal or in network. Furthermore the optimum PLMN cannot be selected for mobile terminated services in which case the mobile station would not be aware of the service in advance and then cannot select the appropriate PLMN in advance and the service request would be rejected already by the PLMN where the mobile station is attached at the time of the

15   service establishment attempt. Hence the prior art does not provide a solution for a fully flexible service request in respect to the terminal and the network capabilities in different modes.

                                    Brief Description of the Figures

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Figure 1 shows a multimode system consisting of a multimode terminal, a number of multimode radio access networks and at least one core network.

Figure 2 shows a flow diagram where the multimode terminal is attached to access

25   network A and the service X is requested.

                                    Disclosure of Invention

The generic problem solved is the generic case where a multimode terminal is served

30   by one system and the terminal supports a service that is not supported by the serving system, but likely would be supported by another system (supported by the multimode terminal with the other system's coverage available). For example, currently a GERAN/UTRAN dual mode terminal cannot request a specific service that it supports only in the UTRAN mode, when it is served by a GERAN network.

The invention is that a generic service request signalling is defined where a multimode terminal is allowed to request any service that it supports in any of the modes (e.g., access technology like GERAN / UTRAN / CDMA2000 / BlueTooth /

5   WLAN / ...) supported by the terminal. The network may then decide to move the terminal to other system if possible and necessary in order to establish the service. The terminal capability indication for each system mode mostly exists already.

It should be mentioned that it would be advantageous for the network to indicate

10   support for the generic service request signalling so that terminal would not send these requests in case the serving network would not support it.

The advantages of the invention are that terminal could start the service regardless the serving system capabilities and the full control is left to the network.

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The terminal would not need to scan the available modes and reselect the system that supports requested service.

Best Mode for Carrying Out the Invention

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1.   Making service request independent from the serving system mode
Since a multimode terminal may support a wide range of services where some specific services are not supported by the mobile in all system modes and some specific services may not be requested from the serving system, it is possible that the

25   terminal (user) does not reach the service it would be able to support, and a service that would be available at the current terminal location through other system modes.

This problem can be solved by a generic service request procedure that allows the terminal to request any of the services it supports, in any of the system modes it

30   supports, through the current serving system.

This generic service request can be implemented in several different ways. Normally the network should indicate support for generic service requests in order to avoid

compatibility problems for new terminals in legacy networks. In case a generic service request is allowed, the terminal may:

- Use existing signalling messages defined for the serving system, but with service request parameters that exceed the terminal capabilities in the serving system mode. An example being 64 kbit/s circuit switched data that is supported by GERAN but may not be supported by the terminal in GERAN mode. Then the multimode terminal may be allowed to request 64 kbit/s data when served by a GERAN network (fig 1 & fig2, for example A=GERAN, B=UTRAN), even if it does not support this service through GERAN. The network may then decide to hand over the dual mode terminal to be served by the UTRAN system (when UTRAN coverage and capacity is available locally), and the requested service may then be established through UTRAN. Alternatively the network may deny this service and the network may then negotiate a service on the currently service system that would be supported both by the terminal and network and would be considered acceptable by the terminal.

- A specific signalling container may be built allowing the serving network to direct the terminal service request to one or more other systems. Optionally an identifier is added to each service request so that the serving system is able to direct each particular service request container only to the corresponding system. Alternatively, all parallel service request containers are sent to each other systems and the other systems identify which container carries a service request for itself. In this case it is sufficient that the terminal builds the service request in a way that is understood by each of the other systems for which the request shall be intended. The serving system then does not need to understand in detail any of the terminal capabilities on other systems, it is sufficient that the service request is transferred to the other system and interpreted locally. If the other system is able to serve terminal with the requested service, the terminal would be moved to be served by this system and the requested service would be established there. One potential solution would be that the target system responds with a handover command or a network controlled cell reselection order that makes the terminal to move to the desired system.

- The serving system capability may be extended so that it is able to decode also service requests for services that are not supported by it (not supported at all

by the system mode of the serving system or just not implemented by the
serving system). This allows a first decision locally by the serving system on
the terminal service request. The serving system may initiate a handover
request (or similar) towards another system or it may directly decide to offer

5   an alternative service that is supported both by the terminal and the current
serving system and which it expects to be adequate for the concerned terminal.

2. Network control for system mode reselection when required to serve any
specific service

10 Several proposals have been made to allow the terminal to select the serving system
according to the service the terminal (user) is requesting at each moment. A terminal
based system mode selection has several serious disadvantages. Examples of the
disadvantages are that:

-   The terminal is not in advance aware which service is best supported by each
15   alternative system.

-   The terminal is not aware of the load of the alternative system, and then it may
be that the alternative system is not at all able to serve the terminal, even with
a lower quality of service, while the original system could have been able to
serve the terminal with a compromise on quality of service.

20 -   System mode changes generate normally significant signalling load that
should be avoided when possible.

-   System mode changes normally result to short gaps where the MS is
unreachable from any of the locally available systems.

25 Clearly it is strongly preferable that the terminal operates on the system where a
multimode network has put the terminal with different network and cell reselection
parameters. The terminal should continue signalling through the serving system as
normally and the control for system selection should be left for the multimode
network. The solution to maintain full control at the multimode network while still

30 making it possible for the terminal to be served with a service it wants and which it
only supports on a non-serving system mode, or that is only supported by a non-
serving system, can be reached by a generic service request procedure that allows the
terminal to request a service that it supports under any of the supported system modes,

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and the generic service request can be sent to the serving network, at lest if indicated being allowed by the serving network.

Detailed Description of the Figures

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Figure 1 is an example of a possible multimode system; this invention is not limited to this example case only. The multimode terminal supports all the access networks but is attached to one of the access networks based on cell selection criteria. Different access networks may have different set of services supported as well as the multimode

10   terminal may support different set of services which may not be aligned with supported services in the access networks. For example possible access networks could be GSM/EDGE, WCDMA, CDMA2000, WLAN, BT, etc.

The flow diagram of figure 2 shows that the requested service is established in the

15   current access network or in alternative access network based on the multimode terminal and the access network capabilities in different modes. Similar flow diagrams are valid if the multimode terminal is attached to other access networks. The multimode terminal is first switched on (1). The multimode terminal then selects (2) and attaches (3) to one of multiple available access networks, in this example the

20   multimode terminal selects access network A. Service X is then requested on access network A (4), where the service X is supported by the multimode terminal in at least one of the multiple modes supported by the multimode terminal and where the service is requested independently of the support for that service by access network A or the multimode terminal in the mode supported by access network A. The serving network

25   then decides (5) either to establish the service in the current mode (6) or decides to move the multimode terminal to another access network. If the service can be established at access network B (7), the serving network requests a handover to access network B (8), the terminal is handed over to access network B (9) and the service is established (10).

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